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IS 10392 (1982): feed water and boiler water for low and medium pressure boilers [CHD 13: Water Quality for Industrial Purposes]



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**IS : 10392 – 1982**  
**(Reaffirmed 1994)**

*Indian Standard*

**SPECIFICATION FOR  
FEED WATER AND BOILER WATER FOR  
LOW AND MEDIUM PRESSURE LAND BOILERS**

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**BUREAU OF INDIAN STANDARDS**  
**MANAK BHAVAN, 9 BAHADUR SHAH ZAFAR MARG**  
**NEW DELHI 110002**

**AMENDMENT NO. 1 DECEMBER 2008**  
**TO**  
**IS 10392 : 1982 SPECIFICATION FOR**  
**. FEED WATER AND BOILER WATER FOR**  
**LOW AND MEDIUM PRESSURE LAND BOILERS**

[Page 5, Table 1, Sl No (i)(d)] — Insert the following after (d):

'e) Residual hydrazine	0.1 to 1	0.1 to 0.5	0.05 to 0.3	26
(as N <sub>2</sub> H <sub>4</sub> ), mg/l	(if added)	(if added)		

[Page 5, Table 1, Sl No. (ii)(f)] — Delete the row.

(Page 6, Note 2) — Substitute the following for the existing:

'NOTE 2 — When feed water heaters are of non-ferrous constructions, the pH of the feed water should be maintained between 8.8 and 9.0 while when feed water heaters are of iron construction, the pH of the feed may be maintained between 9.0 and 9.2.'

# *Indian Standard*

## SPECIFICATION FOR FEED WATER AND BOILER WATER FOR LOW AND MEDIUM PRESSURE LAND BOILERS

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( Continued on page 2 )

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*Indian Standard*  
**SPECIFICATION FOR  
FEED WATER AND BOILER WATER FOR  
LOW AND MEDIUM PRESSURE LAND BOILERS**

**0. FOREWORD**

**0.1** This Indian Standard was adopted by the Indian Standards Institution on 31 December 1982, after the draft finalized by the Boiler Water Sectional Committee had been approved by the Chemical Division Council.

**0.2** Boilers require good quality water for their safe and efficient operation. Natural water accumulates impurities rendering it unfit for use in boilers without treatment. Though water treatment is costly, in the long run it is economic in terms of fuel and time savings. Treated water also increases safety of boilers during operation.

**0.3** This standard lays down the specifications for feed water and boiler water for low and medium pressure land boilers while IS : 1680-1982\* deals with the chemical methods of attaining the conditions to be aimed at for water for land boilers in order to overcome the troubles on the water side of boilers operating up to  $2.0 \text{ MN/m}^2$  (  $20 \text{ kgf/cm}^2$  ) pressure. IS : 1680-1982\* is also generally applicable to boilers operating under medium pressure, that is, between  $2.0$  and  $5.9 \text{ MN/m}^2$  (  $20$  to  $60 \text{ kgf/cm}^2$  ) but not to marine and locomotive boilers and boilers operating at pressures higher than  $5.9 \text{ MN/m}^2$  (  $60 \text{ kgf/cm}^2$  ).

**0.4** For the purpose of deciding whether a particular requirement of this standard is complied with, the final value, observed or calculated, expressing the result of a test or analysis, shall be rounded off in accordance with IS : 2-1960†. The number of significant places retained in the rounded off value should be the same as that of the specified value in this standard.

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\*Code of practice for treatment of water for low and medium pressure land boilers ( *third revision* ).

†Rules for rounding off numerical values ( *revised* ).

## **1. SCOPE**

**1.1** This standard lays down specifications for feed water and boiler water for low and medium pressure land boilers ( boilers operating up to  $5.9 \text{ MN/m}^2$  ).

**1.2** Land boilers operating at pressures higher than  $5.9 \text{ MN/m}^2$ ; marine boilers and locomotive boilers are not covered in this standard.

## **2. REQUIREMENTS**

**2.1** The water shall comply with the requirements given in Table 1 when tested by the methods prescribed in col 6 and 7 of the table.

## **3. SAMPLING**

**3.1** Sampling shall be done following general directions given in 2 of IS : 3025-1964\*. In particular, the following points shall be observed:

- a) It is necessary that a stainless steel or monel metal coil is fitted on the sampling cock so that the temperature of the water sample will be well below the boiling point at atmospheric pressure and there is no risk of aeration and concentration due to flashing into steam; and
- b) Samples of feed water should be collected from the delivery of the boiler feed pump, samples of boiler water from the top drum, and samples of condensate from the delivery of the condensate extraction pump.

## **4. TEST METHODS**

**4.1** Tests shall be carried out as prescribed in the appropriate clauses of IS : 3025-1964\* and IS : 3550-1965† as indicated against the characteristics in Table 1.

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\*Methods of sampling and test ( physical and chemical ) for water used in industry.

†Methods of test for routine control for water used in industry.

**TABLE 1 CHEMICAL REQUIREMENTS OF FEED WATER AND BOILER WATER FOR LOW AND MEDIUM PRESSURE BOILERS**( *Clauses 2.1 and 4.1* )

SL No.	CHARACTERISTIC	REQUIREMENT FOR BOILER PRESSURE			METHOD OF TEST ( REF TO CL No. OF )	
		Up to 2.0 MN/m <sup>2</sup>	2.1 to 3.9 MN/m <sup>2</sup>	4.0 to 5.9 MN/m <sup>2</sup>	IS : 3350- 1965*	IS : 3025- 1964†
(1)	(2)	(3)	(4)	(5)	(6)	(7)
i)	<i>Feed Water</i>					
a)	Total hardness ( as $\text{CaCO}_3$ ), mg/l, <i>Max</i>	10	1.0	0.5	—	16.1
b)	pH value	8.5 to 9.5	8.5 to 9.5	8.5 to 9.5	—	8
c)	Dissolved oxy- gen, mg/l, <i>Max</i>	0.1	0.02	0.01	25	—
d)	Silica ( as $\text{SiO}_2$ ), mg/l, <i>Max</i>	—	5	0.5	16	—
ii)	<i>Boiler Water</i>					
a)	Total hardness ( of filtered sample ) ( as $\text{CaCO}_3$ ), mg/l	← ——— Not detectable ——— →			—	10.1
b)	Total alkali- nity‡ ( as $\text{CaCO}_3$ ), mg/l, <i>Max</i>	700	500	300	—	13
c)	Caustic alkali- nity ( as $\text{CaCO}_3$ ), mg/l, <i>Max</i>	350	200	60	—	15
d)	pH value	11.0 to 12.0	11.0 to 12.0	10.5 to 11.0	—	8
e)	§Residual sodium sulphite ( as $\text{Na}_2\text{SO}_3$ ), mg/l	30 to 50	20 to 30	—	—	21
f)	Residual hydra- zine ( as $\text{N}_2\text{H}_4$ ), mg/l	0.1 to 1 ( if added )	0.1 to 0.5 ( if added )	0.05 to 0.3	26	—
g)	Ratio $\text{Na}_2\text{SO}_3$ / caustic alkali- nity ( as Na OH )	← ——— above 2.5 ——— →			—	20.2 and 15
	or					
	Ratio $\text{NaNO}_3$ / total alkali- nity ( as Na OH )	← ——— above 0.4 ——— →			—	48 and 13

( *Continued* )

**TABLE 1 CHEMICAL REQUIREMENTS OF FEED WATER AND BOILER WATER FOR LOW AND MEDIUM PRESSURE BOILERS — Contd**

(1)	(2)	(3)	(4)	(5)	(6)	(7)
h)	Phosphates { as $\text{PO}_4$ }, mg/l (if added )	20 to 40	15 to 30	5 to 20	14	—
)	Total dissolved solids† mg/l, <i>Alav</i>	3 500¶	2 500	1 500	9	12
k)	Silica ( as $\text{SiO}_2$ ), mg/l	Less than 0.4 of caustic alkalinity		15	16	30

NOTE 1 — *Recovery Boilers* — The boiler feed water used should be completely demineralized and also the boiler feed water and boiler water should be conditioned in accordance with high pressure boilers working at 5.9 MN/m<sup>2</sup> ( 60 kg/cm<sup>2</sup> ) and above ( see IS : 4343-1967\*\* ).

NOTE 2 — When feed water heaters are of copper or copper alloy constructions, the pH of the feed water should be maintained between 8.5 and 9.2 while when feed water heaters are of iron construction, the pH of the feed may be maintained between 8.5 and 9.5.

NOTE 3 — *Silica in Boiler Water* — Lower concentration of silica may be advisable for steam of turbines, which generally require less than 0.02 mg/l silica in steam.

\*Methods of test for routine control for water used in industry.

†Methods of sampling and test ( physical and chemical ) for water used in industry.

‡Total alkalinity should preferably be about 20 percent of total dissolved solids.

§Shall not apply if reducing agents other than sodium sulphite are used.

¶For riveted boilers only.

¶¶For shell type boilers depending on parameters, the limits can be relaxed.

\*\*Code of practice for treatment of water for high pressure boilers ( *under revision* ).

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